Transmittal Letter to the United States Designated/Elected Office (DO/EO/US)

FORM PTO-1390

JC10 Rec'd PCT/PTO 30 JAN 2002

Docket No. : **HM-467PCT**
U.S. Application No. :
International Application No. : **PCT/EP00/07582**
International Filing Date. : **August 4, 2000**
Priority Dates Claimed : **August 6, 1999 and September 10, 1999**
Title of Invention : **METHOD AND INSTALLATION FOR HOT DIP GALVANIZING HOT ROLLED STEEL STRIP**
Applicant(s) for (DO/EO/US) : **Markus Reifferscheid and Rolf Brisberger**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. X This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
2. ___ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.
3. X This express request to begin national examination procedures 35 U.S.C. 371 (f) at any time rather than delay examination until the expiration of the applicable time limit set forth in 35 U.S.C 371(b) and PCT Articles 22 and 39(1).
4. ___ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. X A copy of the International Application as filed [35 U.S.C. 371(c)(2)],
   a) X is transmitted herewith (required only if not transmitted by the International Bureau).
   b) ___ has been transmitted by the international Bureau.
   c) ___ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. X A translation of the International Application into English [35 U.S.C.371(c)(2)].
7. ___ Amendments to the claims of the International Application under PCT Article 19 [35 U.S.C.371(c)(3)].
   a) ___ are transmitted herewith (required only if not transmitted by the International Bureau).
   b) ___ have been transmitted by the International Bureau.
   c) ___ have not been made; however, the time limit for making such amendments has NOT expired.
   d) ___ have not been made and will not be made.
8. ___ A translation of the amendments to the claims under PCT Article 19 [35 U.S.C.371(c)(3)].
9. X An oath or declaration of the inventor(s) [35 U.S.C.371(c)(4)]. UNSIGNED
10. ___ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 [35 U.S.C.371(c)(5)].

Items 11. to 16. below concern other document(s) or information included:

11. X An Information Disclosure Statement under 37 C.F.R. 1.97 and 198.
12. ___ An Assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. X A FIRST preliminary amendment.
    ___ A SECOND or SUBSEQUENT preliminary amendment.
14. ___ A substitute specification.
15. ___ A change of power of attorney and/or address letter.
16. X (other items or information) One sheet of drawing, PTO-1449 w/ 3 references and International Search Report

EXPRESS MAIL No.: EL 862 851 733 US Deposited: January 30, 2002

I hereby certify that this correspondence is being deposited with the United States Postal Service Express mail under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, DC 20231.

Friedrich Kueffner

January 30, 2002
Date

17. X The following fees are submitted:

BASIC NATIONAL FEE [37 CFR 1.492(a)(1)-(5)]:	CALCULATIONS	PTO USE ONLY
X Search Report has been prepared by the EPO or JPO..... $ 890.00		
___ International preliminary examination fee paid to USPTO [37 CFR 1.482]:..... $ 710.00		
___ No International preliminary examination fee paid to USPTO [37 CFR 1.482] but International search fee paid to USPTO [37CFR 1.445(a)(2):..... $ 740.00		
___ Neither International preliminary examination fee [37 CFR 1.482] nor International search fee [37 CFR 1.445(a)(2]) paid to USPTO:..... $ 1040.00		
___ International preliminary examination fee paid to USPTO [37 CFR 1.482] and all claims satisfied provisions of PCT Article 33 (2) to (4):..... $ 100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT:	$ 890.00	
Surcharge of $ 130.00 for furnishing the oath or declaration later than ___20 ___30 months from the earliest claimed priority date [37 CFR 1.492(e)]	$	
Claims filed -20= Extra x Rate: Total Claims 8 -20= x $ 18.=	$	
Indep. Claims 2 - 3= x $ 84.=	$	
Multiple Dependent Claims (if applicable) + $ 280.=	$	
TOTAL OF ABOVE CALCULATIONS:	$ 890.00	
Reduction by ½ for filing by small entity, if applicable. Verified Small Entity Statement must be filed also. [Note 37 CFR 1.9,1.27, 1.28] (divided by 2)		
SUBTOTAL:	$ 890.00	
Processing fee of $ 130.00 for furnishing the English translation later than ___20 ___30 months from the earliest claimed priority date [37 CFR 1.492(f)]	$	
TOTAL NATIONAL FEE:	$ 890.00	
Fee for recording the enclosed assignment [37 CFR 1.21(h)] The assignment must be accompanied by an appropriate cover sheet [37 CFR 3.28,3.31]. $ 40.00 per property	$	
TOTAL FEES ENCLOSED:	$ 890.00	
AMOUNT TO BE REFUNDED:	Refunded	$
AMOUNT TO BE CHARGED:	Charged	$

a) X A check in the amount of $ 890.00 to cover the above fees is enclosed.

b) _ Please charge my Deposit Account No. 11-1835 in the amount of $ to cover the above fees. A duplicate copy of this sheet is enclosed.

c) X The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-1835. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 36 CFR 1.494 or 1.495 has not been met, a petition to revive [37 CFR 1.137(a) or (b)] must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO: Friedrich Kueffner
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New York, NY 10173

Friedrich Kueffner
Name

signature

29,482
Reg. No.

January 30, 2002
Date

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

HM-467PCT

Applicant(s)	:	Markus Reifferscheid and Rolf Brisberger
Serial No.	:	NOT YET KNOWN (PCT/EP00/07582)
Int. Filed	:	August 4, 2000
For	:	METHOD AND INSTALLATION FOR HOT DIP GALVANIZING HOT ROLLED STEEL STRIP

Assistant Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

S I R:

In advance of the first office action, please amend the claims as follows:

IN THE CLAIMS

Replace current claims 1 - 8 by the enclosed amended claims 1 - 8. A marked-up version of amended claims 1 - 8 is also enclosed.

REMARKS

Claims 1 - 8 are in the application.

As a result of the foregoing amendment, the claims have been amended to remove improper multiple dependencies.

Any additional fees or charges required at this time in connection with the application may be charged to our Patent and Trademark Office Deposit Account No. 11-1835.

Respectfully submitted,

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January 30, 2002
FK:ml
ENCLS:
Amended Claims;
Marked-Up Version.

EXPRESS MAIL No.: **EL 862 851 733 US** Deposited: **January 30, 2002**

I hereby certify that this correspondence is being deposited with the United States Postal Service Express mail under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, DC 20231.

Friedrich Kueffner

CLEAN VERSION OF AMENDED CLAIMS

1. Method for hot dip galvanizing of hot-rolled steel strip, wherein:

- in a first method step, the strip (50) is introduced into a pickling station (10-13) and a layer of scale and reaction products are removed from the strip surface in the pickling station,

- in another method step, the strip (50) is introduced into a rinsing station (21-23) and residues of the pickle and pickling products are removed from the strip surface in the rinsing station, and subsequently

- the strip is introduced into a drying station and is dried, and from there

- in another method step, the strip is introduced into a furnace (40) and is adjusted to galvanizing temperature under a protective gas atmosphere, and

- in a last method step, the strip is guided through a galvanizing bath and the surface of the strip (50) is coated with a hot dip galvanizing layer in the galvanizing bath, wherein the strip temperature in the furnace (40) is adjusted at most to 50 °K above immersion temperature into the zinc bath.

2. Method according to claim 1, wherein the H_2 concentration in the furnace (40) is adjusted to at most 20 %, preferably to less than 5 %.

3. Method according to claim 1, wherein the method steps between the last rinsing stage (23) of the rinsing station (20) through the drying station (30) up to the inlet (43) of the furnace (40) are carried out hermetically screened from ambient oxygen from the surroundings.

4. Method according to claim 1, wherein a water-repellent or water-binding medium (25) which wets the strip (50) is introduced into the last rinsing stage (23) of the rinsing station (20).

5. Method according to claim 4, wherein the medium (25) introduced into the third rinsing stage (23) is NH_3 or a solution containing NH_3.

6. Method according to claim 1, wherein drying of the strip (50) in the drying station (30) is carried out without the supply of air from the outside by means of heat radiation with the addition of a mixture of nitrogen, hydrogen and ammonia gas (N_2/NH_3) + H_2 or another mixture of two of the mentioned gases.

7. Hot dip galvanizing plant, comprising a pickling station (10), a rinsing station (20), a drier (30), a furnace (40) and a subsequent hot dip galvanizing bath (60) wherein the outlet of the last rinsing stage (23) of the rinsing station (20) is connected to the inlet of the drier (30) and the outlet of the drier is connected to the inlet (43) of the furnace (40) through locks (70, 80) and the connections are hermetically sealed from the ambient atmosphere.

8. Installation according to claim 7, wherein the rinsing stages (21-23) and the heating stage (41) and the heating stage (42) are screened from each other by intermediate walls (24).

MARKED-UP VERSION OF AMENDED CLAIMS

1. Method for hot dip galvanizing of hot-rolled steel strip, wherein:

- in a first method step, the strip (50) is introduced into a pickling station (10-13) and a layer of scale and reaction products are removed from the strip surface in the pickling station,

- in another method step, the strip (50) is introduced into a rinsing station (21-23) and residues of the pickle and pickling products are removed from the strip surface in the rinsing station, and subsequently

- the strip is introduced into a drying station and is dried, and from there

- in another method step, the strip is introduced into a furnace (40) and is adjusted to galvanizing temperature under a protective gas atmosphere, and

- in a last method step, the strip is guided through a galvanizing bath and the surface of the strip (50) is coated with a hot dip galvanizing layer in the galvanizing bath,

[characterized in

that] <u>wherein</u> the strip temperature in the furnace (40) is adjusted at most to 50 °K above immersion temperature into the zinc bath.

2. Method according to claim 1,

[characterized in

that] <u>wherein</u> the H_2 concentration in the furnace (40) is adjusted to at most 20 %, preferably to less than 5 %.

3. Method according to [claims 1 or 2,

characterized in

that] <u>claim 1, wherein</u> the method steps between the last rinsing stage (23) of the rinsing station (20) through the drying station (30) up to the inlet (43) of the furnace (40) are carried out hermetically screened from ambient oxygen from the surroundings.

4. Method according to [claims 1, 2, or 3,

characterized in

that] <u>claim 1, wherein</u> a water-repellent or water-binding medium (25) which wets the strip (50) is introduced into the last rinsing stage (23) of the rinsing station (20).

5. Method according to claim 4,

[characterized in

that] <u>wherein</u> the medium (25) introduced into the third rinsing stage (23) is NH_3 or a solution containing NH_3.

6. Method according to [one or more of claims 1 to 5, characterized in
that] claim 1, wherein drying of the strip (50) in the drying station (30) is carried out without the supply of air from the outside by means of heat radiation with the addition of a mixture of nitrogen, hydrogen and ammonia gas (N_2/NH_3) + H_2 or another mixture of two of the mentioned gases.

7. Hot dip galvanizing plant, comprising a pickling station (10), a rinsing station (20), a drier (30), a furnace (40) and a subsequent hot dip galvanizing bath (60)
[characterized in
that] wherein the outlet of the last rinsing stage (23) of the rinsing station (20) is connected to the inlet of the drier (30) and the outlet of the drier is connected to the inlet (43) of the furnace (40) through locks (70, 80) and the connections are hermetically sealed from the ambient atmosphere.

8. Installation according to claim 7,
[characterized in
that] wherein the rinsing stages (21-23) and the heating stage (41) and the heating stage (42) are screened from each other by intermediate walls (24).

1/prts

Translation of International Application PCT/EP00/07582
(WO 01/11099 A2)

Method and Installation for Hot Dip Galvanizing of Hot-Rolled Steel Strip

The invention relates to a method and an installation for hot dip galvanizing of hot-rolled steel strip, wherein, in a first method step, the strip is introduced into a pickling station and a layer of scale and reaction products are removed from the strip surface in the pickling station. In a second method step, the strip is introduced into a rinsing station and residues of the pickle and pickling products are rinsed from the strip surface in the rinsing station, and subsequently, the strip is introduced into a drying station and is dried in the drying station. From the drying station, the strip is introduced into a furnace in another method step and is adjusted to galvanizing temperature in the furnace under a protective gas atmosphere. In a last method step, the strip is guided through a galvanizing bath and the surface of the strip is coated in the galvanizing bath with a hot dip galvanizing layer.

Hot dip coating, particularly hot dip galvanizing, of hot-rolled steel strip, so called hot strip, is becoming economically increasingly more important as compared to conventional cold strip hot dip galvanizing. As a result of the development of thin slab technology in hot-rolled strip, there is the technical possibility of producing hot strips in the thickness range of below 1.2 mm from casting heat. There is the additional possibility to substitute cold strip for comparatively inexpensive hot strip in dependence on the requirements of the customer.

Different methods and installations for hot dip coating, particularly hot dip galvanizing, of steel strip are known. They are predominantly types of installation in which cold-rolled strips are used.

In such installations, the actual coating process is preceded by an annealing furnace in which a structural transformation takes place at high temperatures for obtaining the desired mechanical properties. The existing temperature difference between the melt bath, preferably zinc or zinc alloys, and the maximum strip temperature may be up to 400 °C. However, hot dip galvanizing cannot be carried out with this overheated strip, so that the strip must be cooled prior to coating to temperatures close to the melt bath temperature.

In contrast, hot strip or preheated cold strip do not require annealing for influencing the mechanical properties; rather, the strip temperature is merely adjusted to that of the melt bath in order to achieve the desired reaction of the steel strip surface with the alloying components of the melt bath. In contrast, high temperature annealing is frequently disadvantageous for the mechanical properties of the strip.

The present invention relates exemplary exclusively to the various methods of hot strip hot dip refining or hot strip hot dip galvanizing.

The desired temperature level, particularly for hot strip hot dip galvanizing, is in the previously operated installations for hot dip galvanizing still always higher than the required 450 °C of the zinc bath. The reason for this is the required removal of all oxidation products and their prior stages from the steel strip

surface. Oxidation products are inevitably produced in the transition area from the pickling stage through the rinsing and drying stage into the furnace entrance due to the influence of ambient oxygen. The quantity and formation of the oxidation products entering the furnace and the ambient oxygen entrained by the strip determine the necessary method parameters of the treatment procedure, characterized by a required reduction potential, temperature level and holding time. The temperature level which is used is frequently so high that the strip must be additionally cooled prior to entering the zinc bath.

Another method of operation is characterized by a significant increase of the temperature level in the zinc bath to values above 460 °C. A particular disadvantage of this type of method is the increased production of zinc-containing slag. On the one hand, this leads to increased material and operating costs for the zinc bath and, on the other hand, to a reduced quality of the strip.

Starting from the prior art mentioned above, the invention is based on the object of providing a method and a hot strip hot dip galvanizing installation which overcome the disadvantages and difficulties discussed above and produce hot dip galvanized steel strip having a high and defect-free surface quality with an economical amount of material and operating costs.

For meeting this object, the invention proposes in a method of the type mentioned in the preamble of claim 1 to adjust the strip temperature in the furnace at most to 50 °K above immersion temperature in the zinc bath.

The H_2 concentration in the furnace is advantageously adjusted to at most 20 % and preferably to less than 5 %. It is useful to

carry out the method steps between the last rinsing stage of the rinsing station through the drying station up to the entrance of the heating furnace hermetically screened from the ambient oxygen from the surroundings.

Consequently, an installation for carrying out the method according to the invention provides that the outlet of the last rinsing stage of the rinsing station is connected to the inlet of the drier and the outlet of the drier is connected to the inlet of the furnace by locks and are hermetically sealed from the ambient atmosphere.

Additional useful further developments of the method and of the hot dip galvanizing installation for hot strip are provided in accordance with the features of subclaims.

The method and the installation according to the invention advantageously ensure that the optimum surface condition of the strip achieved after passing the strip through the pickling station and the rinsing station is preserved in the subsequent drying stage as well as during the transition in the furnace areas and from the furnace into the galvanizing bath.

This is achieved by:

- the above-mentioned adjustment of the temperature of the strip in the furnace,

- direct coupling of at least the last rinsing stage of the rinsing station through the drying stage with the furnace inlet while screening ambient oxygen,

- application of a water-binding medium, preferably NH_3, or a solution thereof, onto the strip in the rinsing stage, wherein subsequently in the drying stage the water-binding medium can be removed from the strip quickly and without residue, i.e., without the introduction of oxygen or liquid cleaning medium,

- alternatively by operating the drying stage with an atmosphere which has a reducing effect, for example, a N_2/H_2 gas mixture.

As a result of the measures mentioned above, the optimum strip condition is preserved after pickling up into the furnace and an optimum adjustment of the strip temperature when it is immersed into the zinc bath is achieved. The entrance of oxygen and the attendant surface reactions, particularly oxidation, are prevented. This makes it possible to operate the furnace at temperatures in the range of the melt bath temperature. An overheating of the strip and a prolongation of the holding time in the furnace do not take place. A strip cooler is not necessary. The manner of operation according to the invention and the corresponding installation generally make possible a substantially more compact construction of the furnace element and lower investment and operating costs. Simultaneously, it is possible to operate the furnace with low H_2 contents in the protective gas. The disadvantages of the conventional methods mentioned above with increased zinc bath temperature are advantageously eliminated.

This is because, in accordance with the invention, the strip is adjusted to a temperature which is at most 50 °K higher than the immersion temperature in the zinc bath.

Additional details, features and advantages of the invention result from the following explanation of an embodiment which is schematically illustrated in the drawings.

In the drawing:

Fig. 1 shows a layout of a hot dip galvanizing installation according to the prior art,

Fig. 2 shows a layout of a hot dip galvanizing installation according to the invention.

In accordance with the layout of a conventional hot dip galvanizing installation shown in Fig. 1, a strip 50 is introduced in a first method step into a pickling station 10 with three pickling stages 11 to 13 and a layer of scale as well as reaction products are removed from the strip surface in the pickling station. Pickling is usually carried out in the pickling station 10 or in the pickling stages 11, 12, 13 by means of hydrochloric acid (HCl).

In the subsequent method step, the strip 50 is introduced into the rinsing station 20 with the rinsing stages 21 to 23 and residues of the pickle and pickling products are removed in the rinsing station from the strip surface. Subsequently, the strip is introduced into and dried in the drying station 30. From the drying station, the strip 50 is introduced in another method step into a furnace 40 which comprises a preheating stage 41 and an integrated heating stage 42 and the strip is heated in the furnace to galvanizing temperature preferably under a protective gas atmosphere. In a last method step, the strip is guided through a galvanizing bath. In the galvanizing bath, the surface of the

strip 50 is coated with a hot dip galvanizing layer. In contrast to the conventional galvanizing installation according to Fig. 1, in accordance with the layout according to the invention of the hot dip galvanizing installation according to Fig. 2, the method steps between the last rinsing stage 23 of the rinsing station 20 through the drying station 30 up to the inlet 43 of the heating furnace 40 are carried out while being hermetically screened from the ambient oxygen from the surroundings.

By expanding the rinsing station 20 by a rinsing stage 23 or by screening the rinsing stage 23 by means of a separating wall 24 from the preceding rinsing stations 21, 22, a water-repellent or water-binding medium 25 is introduced into the rinsing stage 23. The medium used may be, for example, NH_3 or a solution of NH_3.

A preferred development of the method provides that rinsing of the strip 50 in the rinsing station 20 is carried out in the first stages 21 and 22 with deionized water and in the third stage 23 with the addition of NH_3 as a drying medium.

Drying of the strip 50 in the drying station 30 takes place without the supply of air. In accordance with the invention, drying is carried out by means of thermal radiation with the addition of a mixture of nitrogen, hydrogen and ammonia gas (N_2/NH_3) or H_2.

The drying station 30 is hermetically closed off against the entrance of ambient oxygen on both sides by means of locks 70, 80 adjacent the stations 20 and 40. The outlet of the last rinsing stage 23 of the rinsing station 20 is connected to the inlet of the drying station 30 and the outlet of the drying station 30 is connected to the inlet 43 of the heating furnace 40 through locks

70, 80, and they are hermetically sealed from the ambient atmosphere.

The measures according to the invention maintain the optimum strip condition after pickling up to the heating furnace because the introduction of ambient oxygen is prevented. Consequently, as can be seen in the illustration of the heating furnace 40 in Fig. 2, the construction of the furnace can be simplified and realized with lower investment and operating costs because of the lower necessary heating power and the omission of the cooling stretch. In addition, the furnace operation is possible with comparatively low H_2 contents in the protective gas.

Claims

1. Method for hot dip galvanizing of hot-rolled steel strip, wherein:

- in a first method step, the strip (50) is introduced into a pickling station (10-13) and a layer of scale and reaction products are removed from the strip surface in the pickling station,
- in another method step, the strip (50) is introduced into a rinsing station (21-23) and residues of the pickle and pickling products are removed from the strip surface in the rinsing station, and subsequently
- the strip is introduced into a drying station and is dried, and from there
- in another method step, the strip is introduced into a furnace (40) and is adjusted to galvanizing temperature under a protective gas atmosphere, and
- in a last method step, the strip is guided through a galvanizing bath and the surface of the strip (50) is coated with a hot dip galvanizing layer in the galvanizing bath,

characterized in

that the strip temperature in the furnace (40) is adjusted at most to 50 °K above immersion temperature into the zinc bath.

2. Method according to claim 1,
characterized in
that the H_2 concentration in the furnace (40) is adjusted to at most 20 %, preferably to less than 5 %.

3. Method according to claims 1 or 2,
characterized in
that the method steps between the last rinsing stage (23) of the rinsing station (20) through the drying station (30) up to the inlet (43) of the furnace (40) are carried out hermetically screened from ambient oxygen from the surroundings.

4. Method according to claims 1, 2, or 3,
characterized in
that a water-repellent or water-binding medium (25) which wets the strip (50) is introduced into the last rinsing stage (23) of the rinsing station (20).

5. Method according to claim 4,
characterized in
that the medium (25) introduced into the third rinsing stage (23) is NH_3 or a solution containing NH_3.

6. Method according to one or more of claims 1 to 5,
characterized in
that drying of the strip (50) in the drying station (30) is carried out without the supply of air from the outside by means of heat radiation with the addition of a mixture of nitrogen, hydrogen and ammonia gas $(N_2/NH_3) + H_2$ or another mixture of two of the mentioned gases.

7. Hot dip galvanizing plant, comprising a pickling station (10), a rinsing station (20), a drier (30), a furnace (40) and a subsequent hot dip galvanizing bath (60)
characterized in

that the outlet of the last rinsing stage (23) of the rinsing station (20) is connected to the inlet of the drier (30) and the outlet of the drier is connected to the inlet (43) of the furnace (40) through locks (70, 80) and the connections are hermetically sealed from the ambient atmosphere.

8. Installation according to claim 7,
characterized in
that the rinsing stages (21-23) and the heating stage (41) and the heating stage (42) are screened from each other by intermediate walls (24).

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum
Internationales Büro

(43) Internationales Veröffentlichungsdatum
15. Februar 2001 (15.02.2001)

PCT

(10) Internationale Veröffentlichungsnummer
WO 01/11099 A3

(51) Internationale Patentklassifikation[7]: C23C 2/06, 2/02, 2/00

(21) Internationales Aktenzeichen: PCT/EP00/07582

(22) Internationales Anmeldedatum:
4. August 2000 (04.08.2000)

(25) Einreichungssprache: Deutsch

(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
199 37 216.0 6. August 1999 (06.08.1999) DE
199 43 238.4 10. September 1999 (10.09.1999) DE

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(81) Bestimmungsstaaten *(national)*: AU, BR, BY, CA, CN, ID, IN, JP, KR, MX, NZ, PL, RU, TR, US, ZA.

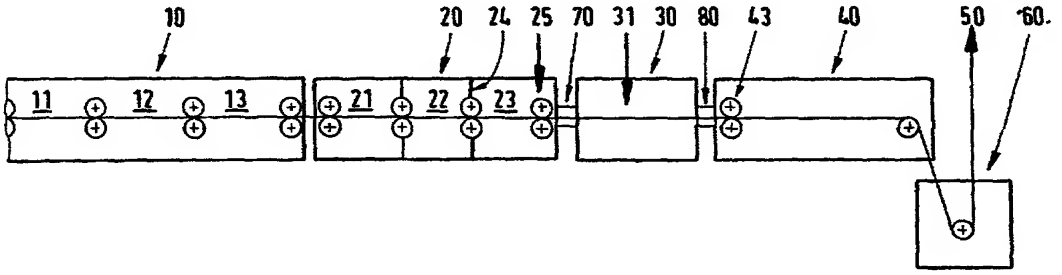
(84) Bestimmungsstaaten *(regional)*: europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Veröffentlicht:
— *mit internationalem Recherchenbericht*

[Fortsetzung auf der nächsten Seite]

(54) **Title:** METHOD AND INSTALLATION FOR HOT DIP GALVANIZING HOT ROLLED STEEL STRIP

(54) **Bezeichnung:** VERFAHREN UND ANLAGE ZUM FEUERVERZINKEN VON WARMGEWALZTEM STAHLBAND



(57) Abstract: The invention relates to a method for hot dip galvanizing hot rolled steel strip and to a hot rolled strip galvanizing installation. In a first method step, the strip (50) to be galvanized is introduced into a pickling station (10) inside of which the layer of scale as well as reaction products are removed from the surface of the strip. In a subsequent working step, the strip (50) is introduced into a rinsing station (20) in which residual pickle and pickle products are removed from the surface of the strip. Afterwards, the strip (50) is introduced into a drying station (30) and dried therein. From there, the strip (50) is introduced, in another method step, into a furnace (40) in which it is heated, under a protective gas atmosphere, up to a galvanizing temperature. In a final method step, the strip is guided through a galvanizing bath in which it is coated with a hot dip galvanizing layer. This method is improved in such a way that the strip (50) is heated in the furnace (40) to a temperature that does not exceed the bath dipping temperature in the zinc bath by more than 50 °K.

(57) Zusammenfassung: Die Erfindung betrifft ein Verfahren zum Feuerverzinken von warmgewalztem Stahlband sowie eine Warmbandverzinkungsanlage. In einem ersten Verfahrensschritt wird zu verzinkendes Band (50) in eine Beizstation (10) eingeführt und darin die Zunderschicht sowie Reaktionsprodukte von der Bandoberfläche entfernt. In einem folgenden Arbeitsschritt wird das Band (50) in eine Spülstation (20) eingeführt und darin die Bandoberfläche von Rückständen der Beize und von Beizprodukten befreit. Anschließend wird das Band (50) in eine Trockenstation (30) eingeführt und getrocknet. Von dort wird das Band (50) in einem weiteren Verfahrensschritt in einen Ofen (40) eingeführt und darin unter Schutzgasatmosphäre auf Verzinkungstemperatur erwärmt, und in einem letzten Verfahrensschritt durch ein Verzinkungsbad hindurchgeführt, wobei es mit einer Feuerverzinkungsschicht überzogen wird. Das Verfahren wird dadurch verbessert, daß das Band (50) im Ofen (40) auf eine Temperatur erwärmt wird, die maximal 50 °K über der Eintauchtemperatur des Bades ins Zinkbad liegt.

WO 01/11099 A3

FIG.1

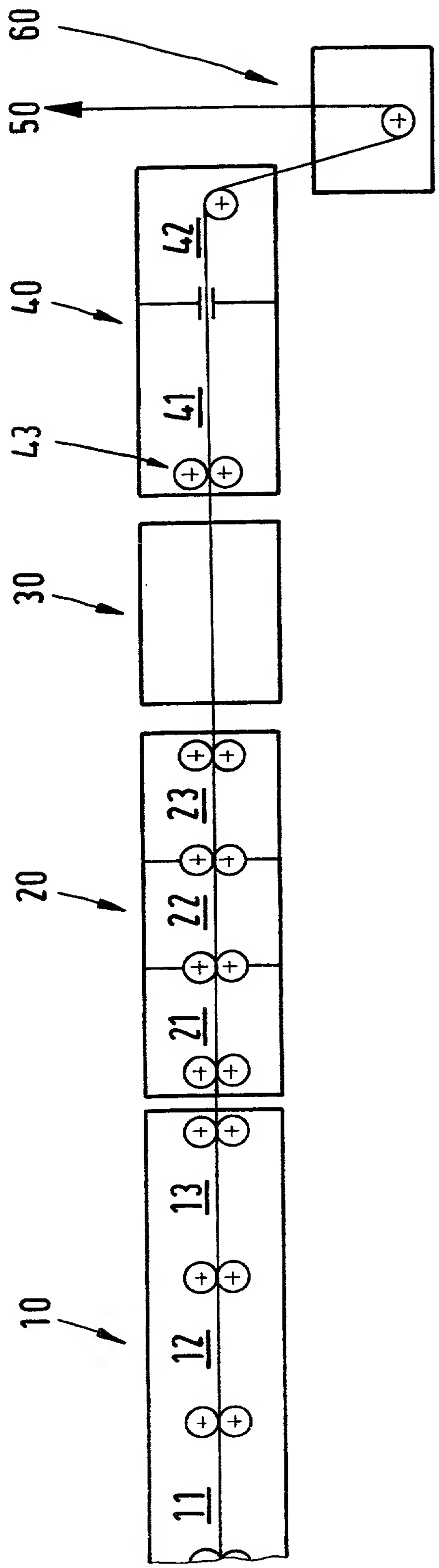

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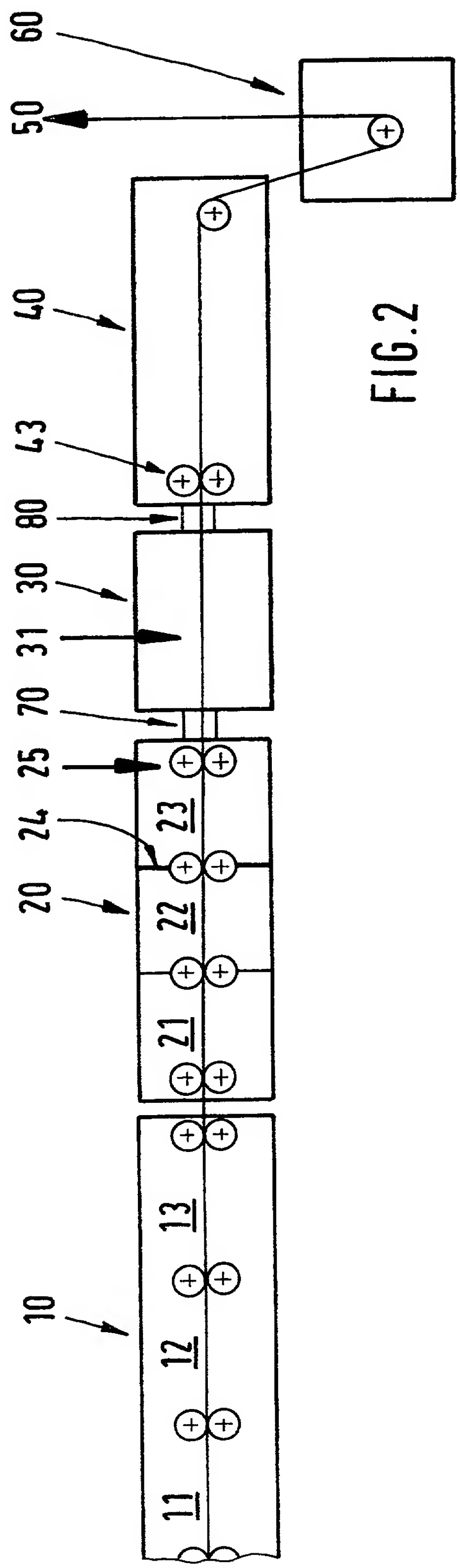
FIG.2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COMBINED DECLARATION FOR PARENT APPLICATION AND POWER OF ATTORNEY *(includes Reference to PCT International Applications)*	Attorney's Docket No. HM-467 40059

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **METHOD AND INSTALLATION FOR HOT DIP GALVANIZING HOT ROLLED STEEL STRIP**

the specification of which (check only one item below):

[ ] is attached hereto.

[ ] was filed as United States application

Serial No. _____
on _____,
and was amended
on _____ (if applicable).

[X] was filed as PCT international application

Number **PCT/EP00/07582**
on **August 4, 2000**,
and was amended under PCT Article 19
on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY *(if PCT, indicate PCT)*	APPLICATION NUMBER	DATE OF FILING *(day, month, year)*	PRIORITY CLAIMED UNDER 35 USC 119
GERMANY	**199 37 216.0**	**6 August 1999**	[X] YES [ ] NO
GERMANY	**199 43 238.4**	**10 September 1999**	[X] YES [ ] NO

Combined Declaration For Parent Application and Power of Attorney (Continued)
(includes Reference to PCT International Applications)

Docket No. **HM-467**

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of the application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty of disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application(s) and the national or PCT internation filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (CHECK ONE)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NO.			

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(List name and registration number)*

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Combined Declaration For Parent Application and Power of Attorney (Continued)
(includes Reference to PCT International Applications)

Docket No. **HM-467**

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2 0 3	FULL NAME OF INVENTOR	*Family Name*	*First Given Name*	*Second Given Name*
	RESIDENCE & CITIZENSHIP	*City*	*State Or Foreign Country*	*Citizenship*
	POST OFFICE ADDRESS	*Post Office Address*	*City*	*State & Zip Code*

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE OF INVENTOR 201	*SIGNATURE OF INVENTOR 202*	*SIGNATURE OF INVENTOR 203*
[signature]	[signature] Rolf B	
DATE Febr. 8. 2002	*DATE* Febr., 18., 2002	*DATE*

PTO-1391 (REV. 10-83)

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